

Claims:

We claim:

1. An apparatus for limiting the movement of the head of a person, the head having a left half and a right half either or both of which are susceptible to changes in geometry over time, the apparatus comprising:

a link system including a plurality of links;

a first plurality of constraints rigidly coupled to a first link of the link system and adapted to engage the left half of the head of the person; and

a second plurality of constraints rigidly coupled to a second link of the link system and adapted to engage the right half of the head of the person;

wherein the link system is configured to exert a force on the head of the person through the first plurality of constraints and the second plurality of constraints such that the head is generally fixed and is further configured to simultaneously adapt to changes in the geometry of the head such that the head remains generally fixed over a period of time.

2. The apparatus of claim 1, wherein the first plurality of constraints and the second plurality of constraints are pins, each pin including a pin head adapted to engage the head of the person.

3. The apparatus of claim 1, wherein the link system comprises:

a first link configured to support the first plurality of constraints;

a second link configured to support the second plurality of constraints;

a third link coupled to the first link; and

a fourth link coupled to the third link and the second link.

4. The apparatus of claim 3, wherein the first link is coupled to the third link at a first joint, the first joint configured to constrain the first link to move in a single degree of freedom relative to the third link and the second link is coupled to the fourth link at a second joint, the second joint configured to constrain the second link to move in a single degree of freedom relative to the fourth link.

5. The apparatus of claim 4, wherein the fourth link is a compliant link and is configured to provide a sufficient amount of force to engage the first plurality of constraints and the second plurality of constraints with the head of the person.
6. The apparatus of claim 5, wherein a combination of the compliant link, the first joint, and the second joint is further configured to simultaneously adapt to changes in the geometry of the head such that the head remains generally fixed relative to the head over a period of time.
7. The apparatus of claim 6, further comprising a torso restraint member adapted to be coupled to a torso of the person, the torso restraint member being coupled to the link system such that the head of the person is fixed relative to the torso of the person.
8. The apparatus of claim 4, wherein the fourth link is coupled to the third link at a third joint, the third joint configured to constrain the third link to move in a single degree of freedom relative to the fourth link.
9. The apparatus of claim 8, further comprising a compliant link coupled to the third link and the fourth link, wherein the compliant link is configured to provide a sufficient amount of force to engage the first plurality of constraints and the second plurality of constraints with the head of the person.
10. The apparatus of claim 9, wherein a combination of the compliant link, the first joint, the second joint, and the third joint is further configured to simultaneously adapt to changes in the geometry of the head such that the head remains generally fixed relative to the head over a period of time.
11. The apparatus of claim 10, further comprising a torso restraint member adapted to be coupled to a torso of the person, the torso restraint member being coupled to the link system such that the head of the person is fixed relative to the torso of the person.
12. The apparatus of claim 8, further comprising a compliant member coupled to the third link

and the fourth link, the compliant member including a compliant link, wherein the compliant link is configured to provide a sufficient amount of force to engage the first plurality of constraints and the second plurality of constraints with the head of the person.

13. The apparatus of claim 12, wherein a combination of the compliant link, the first joint, the second joint, and the third joint is further configured to simultaneously adapt to changes in the geometry of the head such that the head remains generally fixed relative to the head over a period of time.

14. The apparatus of claim 13, wherein the compliant member further comprises a force applier, the force applier configured to adjust the force provided by the compliant link.

15. The apparatus of claim 14, wherein the force applier is coupled to one of the third link and the fourth link and the compliant link is coupled to the other of the third link and the fourth link, the force applier further coupled to the compliant link.

16. The apparatus of claim 14, further comprising a torso restraint member adapted to be coupled to a torso of the person, the torso restraint member being coupled to the link system such that the head of the person is fixed relative to the torso of the person.

17. An apparatus for limiting the movement of a head of a person, the apparatus comprising:
a first link configured to support a first plurality of constraints rigidly coupled to the first link and adapted to engage the left half of the head of the person;
a second link configured to support a second plurality of constraints rigidly coupled to the second link and adapted to engage the left half of the head of the person;
a third link coupled to the first link at a first joint;
a fourth link coupled to the second link at a second joint and coupled to the third link at a third joint; and
a force applier coupled to the third link and the fourth link, the force applier configured to load each of the first plurality of constraints and each of the second plurality of constraints simultaneously such that each of the first plurality of constraints and each of the

second plurality of constraints engages the head with generally the same amount force.

18. The apparatus of claim 17, wherein the third link spans generally from the left half of the head at a first end of the third link to the right half of the head at a second end of the third link.

19. The apparatus of claim 17, further comprising a torso restraint member adapted to be coupled to a torso of the person, the torso restraint member being coupled to the third link such that the head of the person is fixed relative to the torso of the person.

20. A method of limiting the movement of a head of a person over time, the head being susceptible to changes in geometry over time, the method comprising the steps of:

placing a first apparatus adjacent the head of the person, the apparatus including at least a first constraint and a second constraint located adjacent a first side of the head and a third constraint and a fourth constraint located adjacent a second side of the head;

engaging each of the first, second, third, and fourth constraints with the head of the person with a force sufficient to limit the movement of the head of the person; and

automatically adapting the apparatus to changes in the geometry of the head over such that the head remains generally fixed over time.

21. The method of claim 20, wherein each of the first, second, third, and fourth constraints are engaged simultaneously.

22. The method of claim 20, further comprising the steps of:

placing a second apparatus adjacent a torso of the person, the second apparatus being secured to the torso;

coupling the first apparatus to the second apparatus such that head of the person is coupled to the torso of the person.